



# Operating Instructions

KSR-GT 677

4 ... 20 mA/HART



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# 1 About this document

## 1.1 Function

This operating instructions manual has all the information you need for quick setup and safe operation of KSR-GT 677. Please read this manual before you start setup.

## 1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual should be made available to these personnel and put into practice by them.

## 1.3 Symbolism used



### Information, tip, note

This symbol indicates helpful additional information.



### Caution, warning, danger

This symbol informs you of a dangerous situation that could occur. Ignoring this cautionary note can impair the person and/or the instrument.



### Ex applications

This symbol indicates special instructions for Ex applications.



### List

The dot set in front indicates a list with no implied sequence.



### Action

This arrow indicates a single action.



### Sequence

Numbers set in front indicate successive steps in a procedure.

## **2 For your safety**

### **2.1 Authorised personnel**

All operations described in this operating instructions manual must be carried out only by trained, specialised personnel authorised by the operator. For safety and warranty reasons, any internal work on the instruments must be carried out only by personnel authorised by the manufacturer.

### **2.2 Appropriate use**

KSR-GT 677 is a sensor for continuous level measurement in liquids.

### **2.3 Warning about misuse**

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

### **2.4 General safety instructions**

KSR-GT 677 is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards (e.g. the VDE regulations in Germany) as well as all prevailing safety regulations and accident prevention rules.

### **2.5 CE conformity**

KSR-GT 677 is in CE conformity with EMC (89/336/EWG), fulfils the NAMUR recommendation NE 21 and is in CE conformity with NSR (73/23/EWG).

Conformity has been judged acc. to the following standards:

- EMC:
  - Emission EN 61326: 2004 (class B)
  - Susceptibility EN 61326: 2004 incl. supplement A
- NSR: EN 61010-1: 2001

## **2.6 Safety information for Ex areas**

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

## 3 Product description

### 3.1 Configuration

#### Scope of delivery

The scope of delivery encompasses:

- KSR-GT 677 level sensor
- Documentation
  - this operating instructions manual
  - Ex-specific safety instructions (with Ex versions) and, if necessary, further certificates

#### Components

KSR-GT 677 consists of:

- Process fitting with probe
- Housing with electronics
- Housing cover, optionally available with indicating/adjustment module

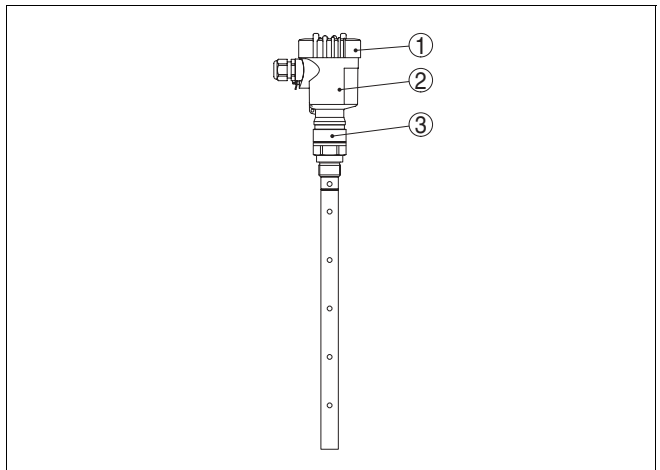


Fig. 1: KSR-GT 677 in tube version with plastic housing

- 1 Housing cover, optionally available with indicating/adjustment module
- 2 Housing with electronics
- 3 Process fitting

### 3.2 Principle of operation

#### Area of application

KSR-GT 677 is a level sensor with coax, rod or cable probe for continuous interface measurement.

It is designed for industrial use in all areas of process technology and is used in liquids.

**Physical principle**

High frequency microwave impulses are guided along a steel cable or rod or a rod inside a steel tube. When reaching the product surface, a part of the microwave impulses is reflected. The other part passes the upper product and is reflected a second time by the interface. The running times to the two product layers are processed by the instrument.

**Pre-requisites for the interface measurement****Upper medium (L2)**

- The upper medium must not be conductive
- The dielectric value of the upper medium must be known (input required). Min. dielectric values: rod version 1.7, coax version 1.4.
- The composition of the upper medium must be stable - no varying products or mixtures
- The upper medium must be homogeneous - no stratifications within the medium
- Min. thickness of the upper medium: 100 mm
- Clear separation from the lower medium - no emulsion phase, no mull layer
- If possible, no foam on the surface

**Lower medium (L1)**

- The dielectric value must be 10 times higher than the dielectric value of the upper medium - preferably electrically conductive. Example: upper medium dielectric value 2, lower medium at least dielectric value 12

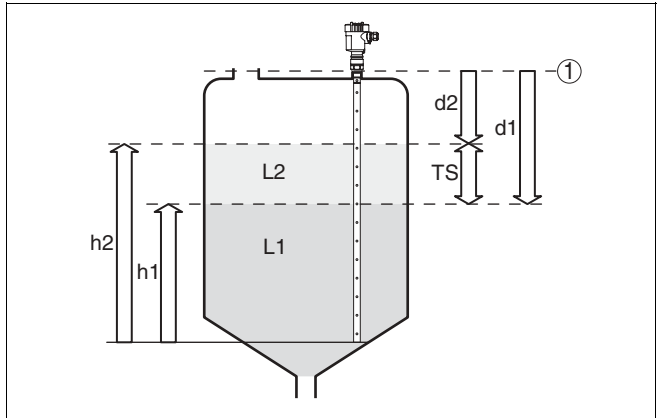


Fig. 2: Interface measurement

- 1 Reference plane
- d1 Distance to the interface (HART value 1 or Primary Value)
- d2 Distance to the level (HART value 3 or Third Value)
- TS Thickness of the upper medium ( $d1 - d2$ )
- h1 Height - Interface
- h2 Height - Level
- L1 Lower medium
- L2 Upper medium

## Output signal

The interface is processed directly from the sensor.

The analogue output (4 ... 20 mA) transmits the height of the interface (h1) in percent. This is also the value being adjusted.

The display of the indicating/adjustment module outputs the distance to the interface (d1) in m(d).

The HART protocol can transmit the distance to the interface - HART value 1 (d1) and the distance to the level (d2) - HART value 3.

E.g. the values can be evaluated with a HART interface module (HIM).

## Power supply

Two-wire electronics 4 ... 20 mA/HART for power supply and measured value transmission on the same cable.

The power supply range can differ depending on the instrument version. The exact range is stated in the "Technical data" in the "Supplement".

### 3.3 Adjustment

KSR-GT 677 can be adjusted with three different adjustment media:

- with indicating/adjustment module
- a HART handheld

The entered parameters are generally saved in KSR-GT 677, optionally also in the indicating/adjustment module.

### 3.4 Storage and transport

#### Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test acc. to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

#### Storage and transport temperature

- Storage and transport temperature see "*Supplement – Technical data – Ambient conditions*"
- Relative humidity 20 ... 85 %

## 4 Mounting

### 4.1 General instructions

#### Installation position

Select an installation position you can easily reach for mounting and connecting as well as later retrofitting of an indicating and adjustment module. The housing can be rotated by 330° without the use of any tools. You can also install the indicating and adjustment module in four different positions (each displaced by 90°).

#### Handling

With screwed versions, the housing must not be used for screwing in! Tightening can cause damages on the locking piston of the housing.

To screw in, use the hexagon above the thread.

#### Moisture

Use the recommended cable (see chapter "*Connecting to power supply*") and tighten the cable entry.

You can give your KSR-GT 677 additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

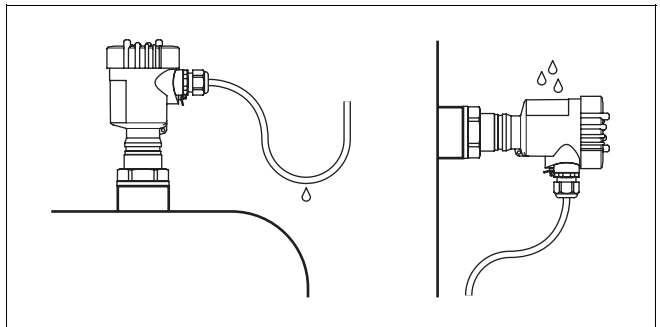


Fig. 3: Measures against moisture penetration

#### Measuring range

The reference plane for the measuring range of the sensors is the seal surface of the thread or flange.

Keep in mind that a min. distance (dead band) must be maintained below the reference plane and possibly at the end of the probe - measurement in these areas is not possible. Also note that the cable length cannot be utilised all the way to

the end of the probe, as measurement in the area of the gravity weight is not possible. These min. distances (dead band) are stated in the Technical data in the Supplement.

**Pressure**

The process fitting must be sealed if there is gauge or low pressure in the vessel. Before use, check if the seal material is resistant against the measured product. The max. permissible pressure is stated in the "Technical data" in the "Supplement" or on the type label of the sensor.

## 4.2 Mounting information

**Installation position**

Mount KSR-GT 677 in such a way that the probe does not touch any installations or the vessel wall during installation.

Mount cable and rod versions of KSR-GT 677 in such a way that the distance to vessel installations or vessel wall is at least 300 mm (12 in).

During operation, the probe must not touch any installations or the vessel wall. If necessary, fasten the probe end.

In vessels with conical bottom it can be advantageous to mount the sensor in the center of the vessel, as measurement is then possible down to the lowest point of the vessel bottom. When using the cable version, make sure that a measurement up to the probe tip is not possible. The exact value of the min. distance (lower dead band) is stated in the Technical data in the Supplement.

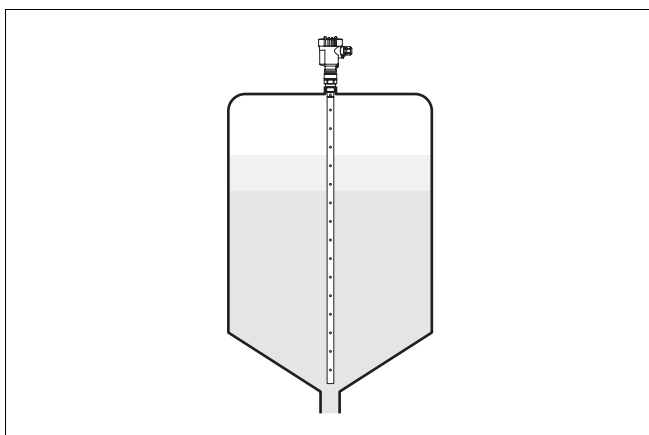
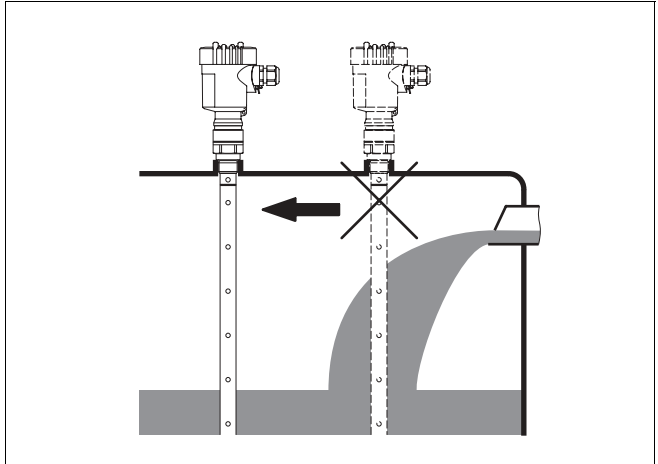


Fig. 4: Vessel with conical bottom

## Inflowing material

Make sure that the probe is not subjected to strong lateral forces. Mount KSR-GT 677 at a location in the vessel where no disturbing influence from e.g. filling openings, agitators, etc. can occur.



*Fig. 5: Lateral load*

## Fasten

If the probe can touch the vessel wall during operation due to product movements or agitators etc., the probe should be strained.

There is a thread (M12) in the gravity weight, e.g. for a lug.

Make sure that the probe cable is not completely taut. Avoid tensile loads on the rope.

Avoid undetermined cable-vessel-connection, i.e. the connection must be either grounded reliably or isolated reliably. Any change of this requirement will cause measurement errors.

## 5 Connecting to power supply

### 5.1 Preparing the connection

#### Note safety instructions

Always observe the following safety instructions:

- Connect only in the complete absence of line voltage
- If overvoltages are expected, overvoltage arresters should be installed.

#### Take note of safety instructions for Ex applications



In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

#### Select power supply

Power supply and current signal are transmitted via the same two-wire connection cable. The power supply range can differ depending on the instrument version. The exact range is stated in the "*Technical data*" in the Supplement.

Provide a reliable separation between the supply circuit and the mains circuits acc. to DIN VDE 0106 part 101.

Bear in mind the following factors regarding supply voltage:

- the reduction of the output voltage of the power supply unit under nominal load (with a sensor current of 20.5 mA or 22 mA in case of fault signal)
- the influence of additional instruments in the circuit (see load values in *Technical data*).

#### Select connection cable

KSR-GT 677 is connected with standard, unscreened two-wire cable. An outer cable diameter of 5 ... 9 mm ensures the seal effect of the cable entry. If electromagnetic interference is expected, we recommend the use of screened cable.

#### Cable screening and grounding

Connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal outside on the housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the connection on the evaluation side must be made via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Select connection  
cable for Ex applica-  
tions



Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

## 5.2 Connection procedure

Proceed as follows:

- 1 Unscrew the housing cover
- 2 If an indicating and adjustment module is installed, remove it by turning it slightly to the left.
- 3 Loosen compression nut of the cable entry
- 4 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires
- 5 Insert the cable into the sensor through the cable entry
- 6 Lift the opening levers of the terminals with a screwdriver (see following illustration)
- 7 Insert the wire ends into the open terminals according to the wiring plan

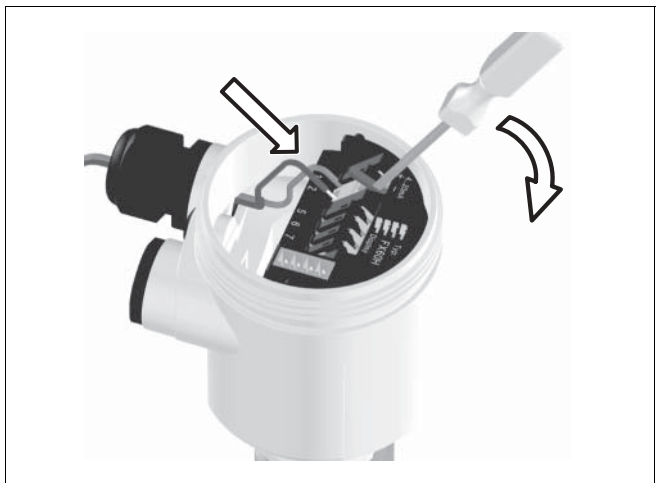


Fig. 6: Connection steps 6 and 7

- 8 Press down the opening levers of the terminals, you will hear the terminal spring closing
  - 9 Check the hold of the wires in the terminals by lightly pulling on them
  - 10 Connect the screen to the internal ground terminal and the external ground terminal to potential equalisation
  - 11 Tighten the compression nut of the cable entry, the seal ring must completely encircle the cable
  - 12 Screw the housing cover back on
- The electrical connection is finished.

### 5.3 Wiring plans, single chamber housing



The following illustrations apply to the non-Ex as well as to the Ex ia version.

#### Housing overview

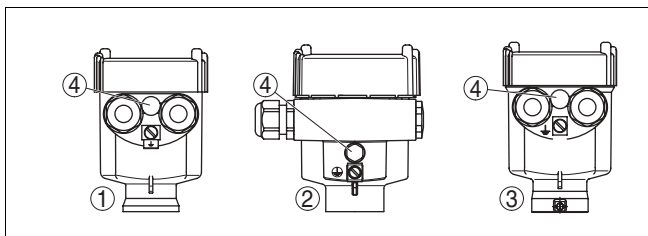


Fig. 7: Material versions, single chamber housing

- 1 Plastic
- 2 Aluminium
- 3 Stainless steel
- 4 Filter element for pressure compensation

## Electronics and connection compartment

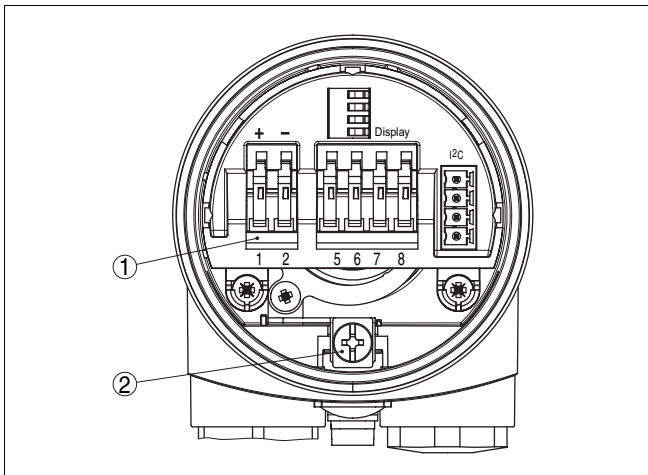


Fig. 8: Electronics and connection compartment, single chamber housing

- 1 Spring-loaded terminals for power supply
- 2 Ground terminal for connection of the cable screen

## Wiring plan

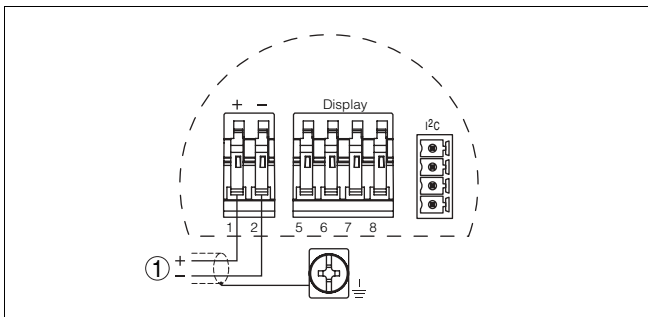


Fig. 9: Wiring plan, single chamber housing

- 1 Power supply/Signal output

## 5.4 Wiring plans, double chamber housing



The following illustrations apply to the non-Ex as well as to the Ex ia version. The Exd version is described in the next subchapter.

## Housing overview

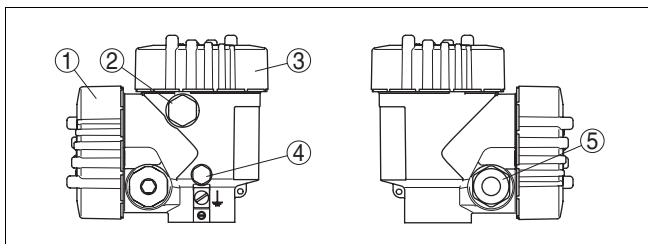


Fig. 10: Double chamber housing

- 1 Housing cover, connection compartment
- 2 Blind stopper
- 3 Housing cover, electronics compartment
- 4 Filter element for pressure compensation
- 5 Cable entry or plug

## Electronics compartment

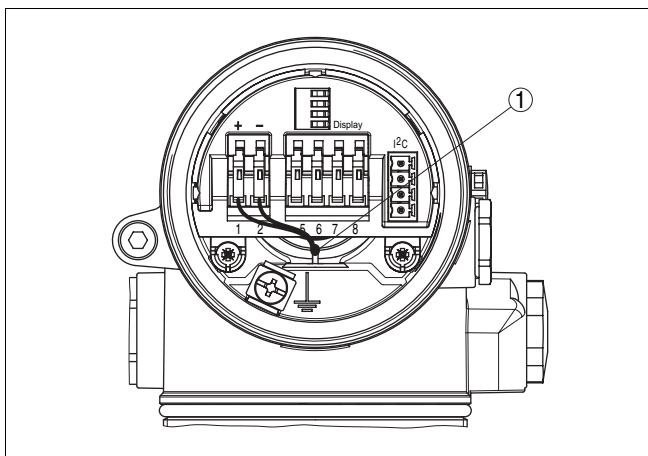


Fig. 11: Electronics compartment, double chamber housing

- 1 Internal connection cable to the connection compartment

## Connection compartment

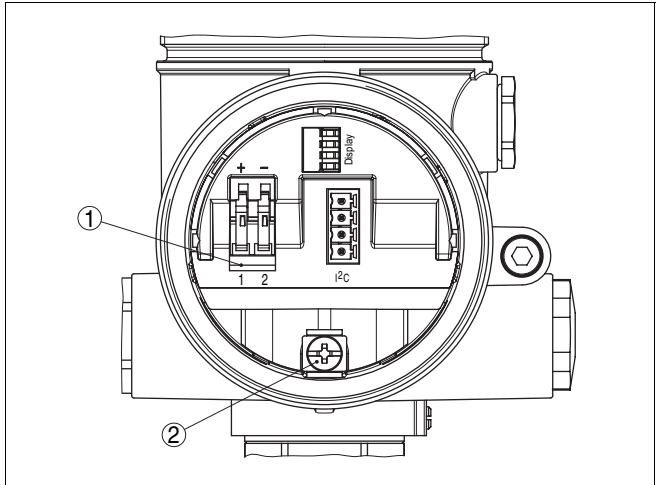


Fig. 12: Connection compartment, double chamber housing

- 1 Spring-loaded terminals for power supply
- 2 Ground terminal for connection of the cable screen

## Wiring plan

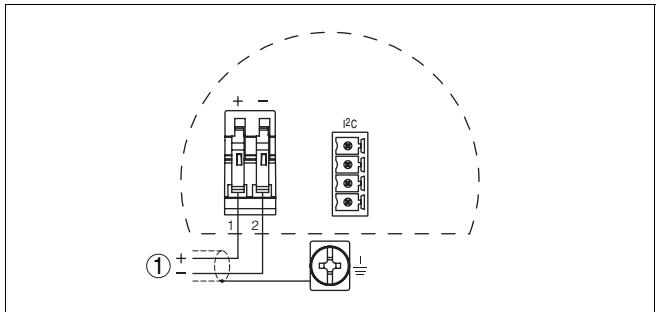


Fig. 13: Wiring plan, double chamber housing

- 1 Power supply/Signal output

## 5.5 Wiring plans, double chamber housing Exd

### Housing overview

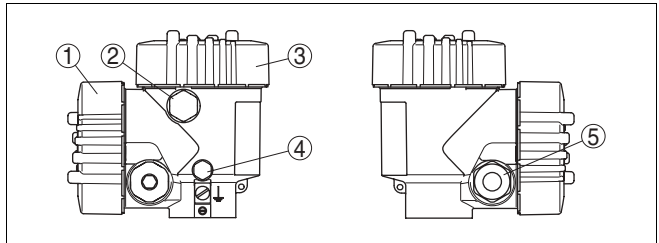


Fig. 14: Double chamber housing

- 1 Housing cover, connection compartment
- 2 Blind stopper
- 3 Housing cover, electronics compartment
- 4 Filter element for pressure compensation
- 5 Cable entry or plug

### Electronics compartment

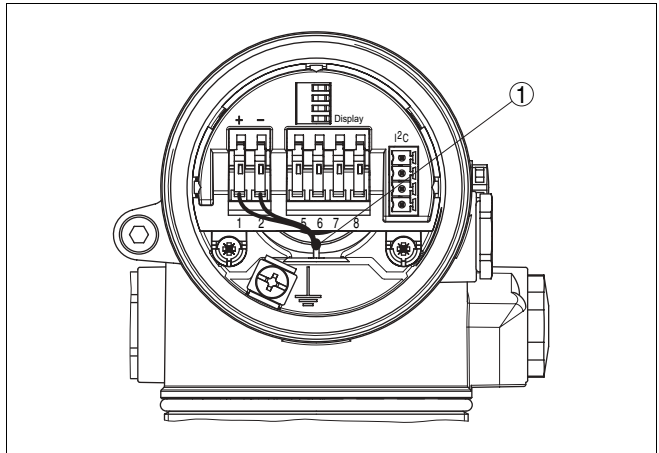


Fig. 15: Electronics compartment, double chamber housing

- 1 Internal connection cable to the connection compartment

## Connection compartment

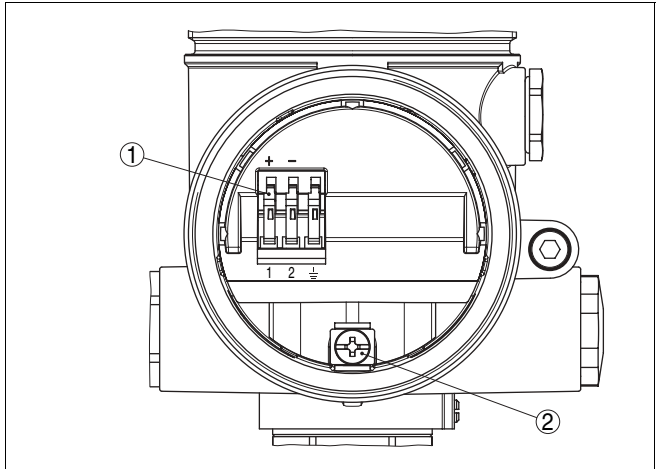


Fig. 16: Connection compartment, double chamber housing Exd  
 1 Spring-loaded terminals for power supply and cable screen  
 2 Ground terminal for connection of the cable screen

## Wiring plan

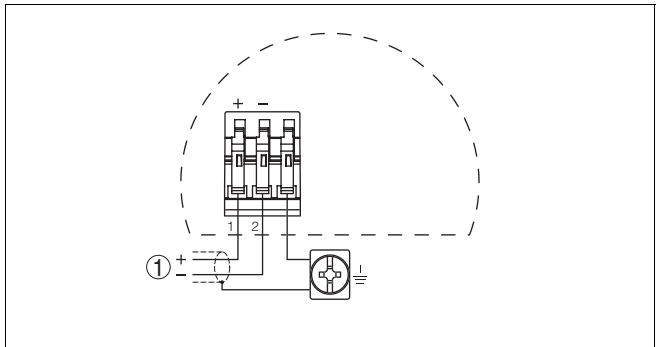


Fig. 17: Wiring plan, double chamber housing Exd  
 1 Power supply/Signal output

## 6 Setup with the indicating/adjustment module

### 6.1 Short description

#### Function/Configuration

The indicating/adjustment module is used for measured value display, adjustment and diagnosis. It can be mounted in all sensors of the GT 6 instrument family, in the single as well as double chamber housing (optionally in the electronics or connection compartment).

### 6.2 Insert the indicating and adjustment module

The indicating/adjustment module can be inserted or removed at any time. It is not necessary to interrupt the power supply.

To mount, proceed as follows:

- 1 Unscrew the housing cover
- 2 Place the indicating/adjustment module in the desired position on the electronics (you can choose any one of four different positions - each displaced by 90°)
- 3 Press the indicating and adjustment module onto the electronics and turn it to the right until it snaps in.
- 4 Screw housing cover with inspection window tightly back on

Removal is carried out in reverse order.

The indicating/adjustment module is powered by the sensor, an additional connection is not necessary.

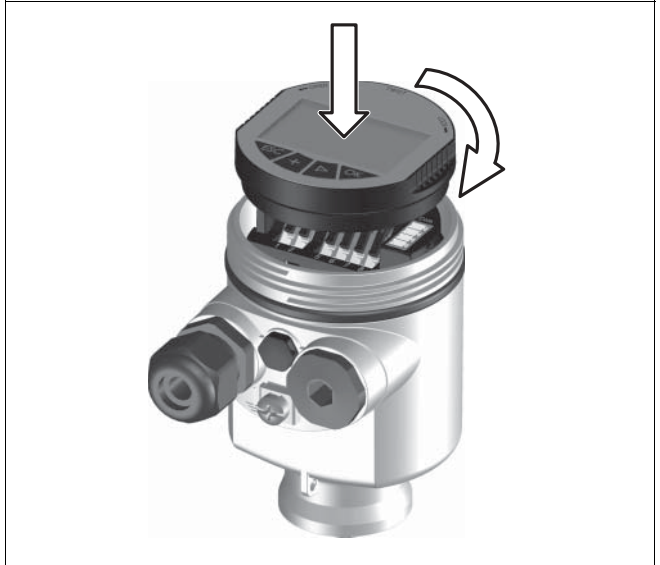


Fig. 18: Installing the indicating/adjustment module



**Note:**

If you intend to retrofit KSR-GT 677 with an indicating/adjustment module for continuous measured value indication, a higher cover with an inspection glass is required.

### 6.3 Adjustment system

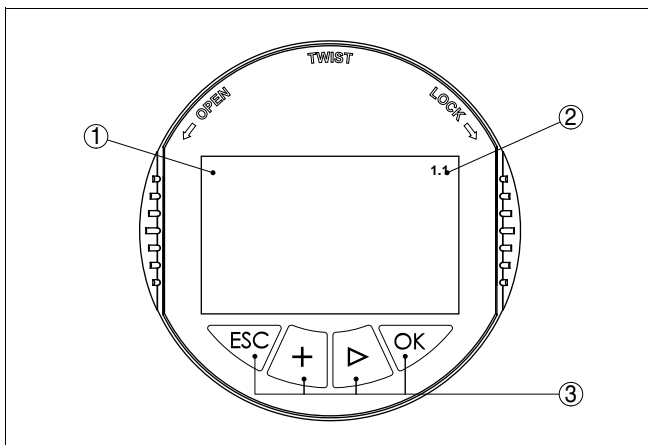


Fig. 19: Indicating and adjustment elements

- 1 LC display
- 2 Indication of the menu item number
- 3 Adjustment keys

#### Key functions

- **[OK]** key:
  - move to the menu overview
  - confirm selected menu
  - edit parameter
  - save value
- **[>]** key to select:
  - menu change
  - list entry
  - editing position
- **[+]** key:
  - modify value of a parameter
- **[ESC]** key:
  - interrupt input
  - jump to the next higher menu

#### Adjustment system

The sensor is adjusted via the four keys of the indicating and adjustment module. The LC display indicates the individual menu items. The functions of the individual keys are shown in the above illustration. Approx. 10 minutes after the last pressing of a key, an automatic reset to measured value indication is triggered. Any values not confirmed with **[OK]** will not be saved.

## 6.4 Setup procedure

### Switch on phase

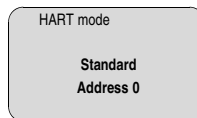
After KSR-GT 677 is connected to power supply, the instrument carries out a self-test for approx. 30 seconds. The following steps are carried out:

- Internal check of the electronics
- Indication of the instrument type, the firmware version as well as the sensor TAGs (sensor name)
- Output signal jumps briefly (approx. 10 seconds) to the set fault current

Then the actual measured value is displayed and the corresponding current is transmitted to the cable.<sup>1)</sup>

### Address setting HART-Multidrop

In HART-Multidrop mode (several sensors on one input) the address must be set before continuing with the parameter adjustment. You will find a detailed description in the operating instructions manual of the indicating/adjustment module.



### Parameter adjustment

Because KSR-GT 677 is a distance measuring instrument, the distance from the sensor to the product surface is measured. In order to have the actual product level displayed, an allocation of the measured distance to the height percentage must be carried out. To make this adjustment, the full and empty distances in the vessel are entered. If these values are known, it is also possible to carry out the adjustment with other distances, e.g. 10 % and 90 %. Starting point of these distance values is always the seal surface of the thread or flange. The actual level is then calculated on the basis of these entered values. At the same time, the operating range of the sensor is limited from maximum range to the requested range.

The real product level during this adjustment is not important, because the min./max. adjustment is always carried out without changing the product level. These settings can be made ahead of time without the instrument having to be installed.

In the main menu item "*Basic adjustment*", the individual submenu items should be selected one after the other and provided with the correct parameter values.

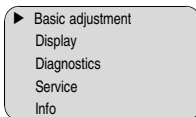
<sup>1)</sup> The values correspond to the actual level as well as to the settings already carried out, e.g. default setting.

Start your parameter adjustment with the following menu items of the basic adjustment:

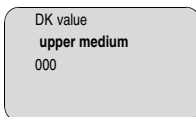
### Carrying out min. adjustment

Proceed as follows:

- 1 Move from the measured value display to the main menu by pushing **[OK]**.

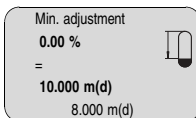


- 2 Select the menu item *Basic adjustment* with **[→]** and confirm with **[OK]**. Now the menu item "DK value" is displayed.



- 3 Enter the DK value of the upper medium and confirm with **[OK]**.

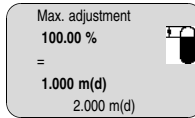
Save the settings with **[OK]** and move to "Min. adjustment" with **[→]**.



- 4 Prepare the % value for editing with **[OK]** and set the cursor to the requested position with **[→]**. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the distance value.
- 5 Enter the appropriate distance value in m (corresponding to the percentage value) for the empty vessel (e.g. distance from the sensor to the vessel bottom).
- 6 Save the settings with **[OK]** and move to "Max. adjustment" with **[→]**.

### Carry out max. adjustment

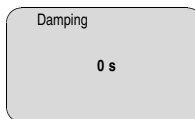
Proceed as follows:



- 1 Prepare the % value for editing with **[OK]** and set the cursor to the requested position with **[→]**. Set the requested percentage value with **[+]** and save with **[OK]**. The cursor jumps now to the distance value.
- 2 Enter the appropriate distance value in m (corresponding to the percentage value) for the full vessel. Keep in mind that the max. level must lie below the dead band.
- 3 Save the settings with **[OK]**.

## Damping

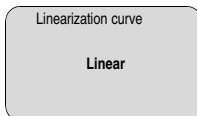
To suppress fluctuation in the measured value display, e.g. caused by a turbulent product surface, an integration time can be set. This time can be between 0 and 999 seconds. Please note that the reaction time of the entire measurement will be longer and the sensor will react to quick changes of the measured value with a corresponding delay. In general, a time of a few seconds is sufficient to smooth the measured value display.



Enter the requested parameter via the appropriate keys, save your settings and jump to the next menu item with the **[→]** key.

## Linearization curve

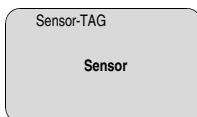
A linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level – e.g. in a cylindrical or spherical tank – and the indication or output of the volume is requested. Corresponding linearization curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set in the menu item "Display".



Enter the requested parameter via the appropriate keys, save your settings and jump to the next menu item with the **[→]** key.

### Sensor-TAG

In this menu item you can enter an unambiguous designation for the sensor, e.g. the measurement loop name or the tank or product designation. In digital systems and in the documentation of larger plants, a singular designation should be entered for exact identification of individual measuring sites.



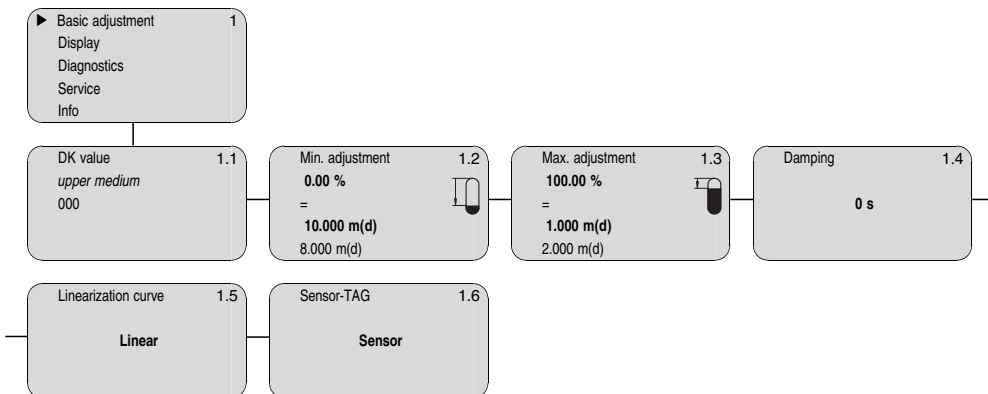
With this menu item, the Basic adjustment is finished and you can now jump to the main menu with the **[ESC]** key.

### Optional settings

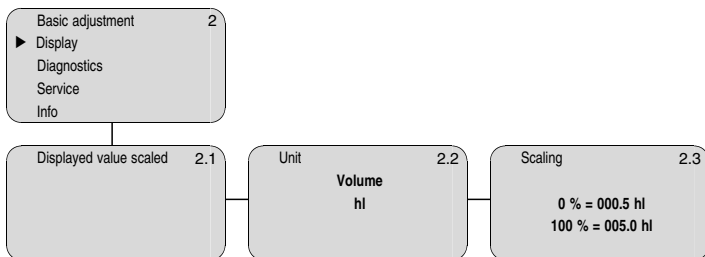
Additional adjustment and diagnosis options such as e.g. scaling, simulation or trend curve presentation are shown in the following menu schematic. You will find a detailed description of these menu items in the operating instructions manual of the indicating and adjustment module.

## 6.5 Menu schematic

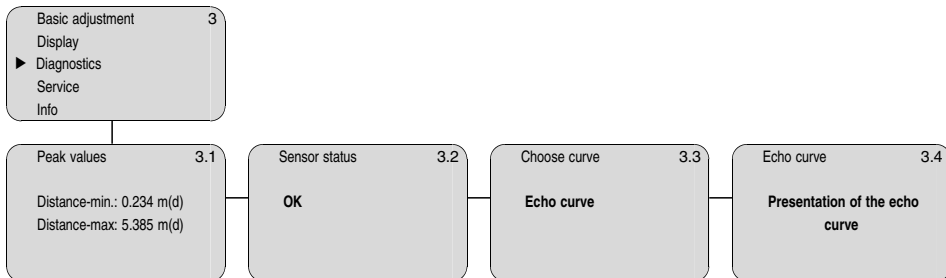
### Basic adjustment



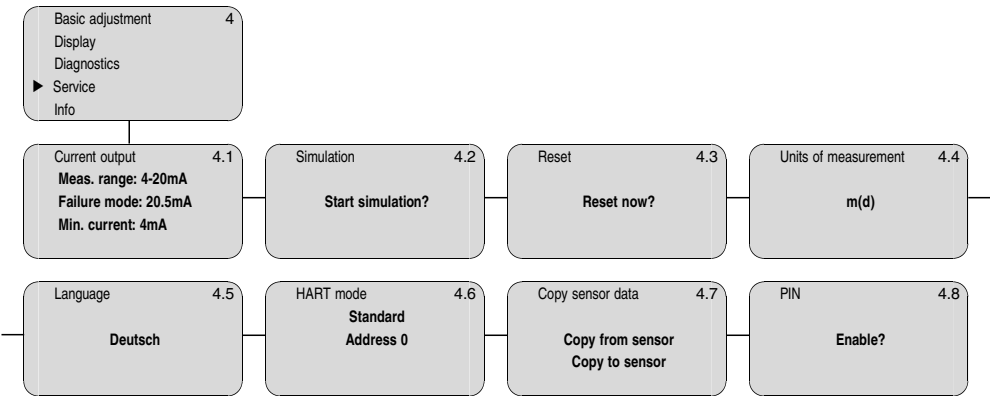
### Display



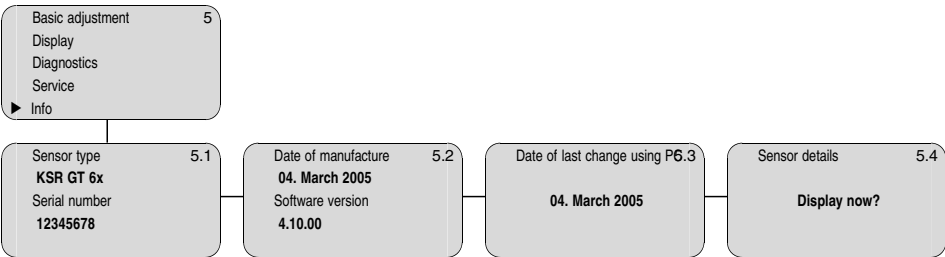
### Diagnostics



Service



Info



## 7 Maintenance and fault rectification

### 7.1 Maintenance

When used as directed in normal operation, KSR-GT 677 is completely maintenance-free.

### 7.2 Fault rectification

#### Checking the 4 ... 20 mA signal

Connect a hand-held multimeter with a suitable measuring range acc. to the wiring plan.

#### ? 4 ... 20 mA signal not stable

- supply voltage too low or load resistance too high
- check and adapt, if necessary

#### ? 4 ... 20 mA signal missing

- incorrect connection to power supply
- Check connection acc. to chapter "*Connection procedure*" and correct, if necessary, acc. to chapter "*Wiring plans*"
- no power supply
- check cables for line break, repair, if necessary
- supply voltage too low or load resistance too high
- check and adapt, if necessary

#### ? Current signal greater than 22 mA or less than 3.6 mA

- Electronics module defective
- exchange instrument or return it for repair



In Ex applications, the regulations for the wiring of intrinsically safe circuits must be observed.

#### Fault messages via the indicating/adjustment module

#### ? E013

- no measured value available
- sensor in boot phase

→ sensor does not find an echo, e.g. because of faulty installation or incorrect parameter adjustment

→ Wrong sensor length entered

**? E017**

- adjustment span too small

→ Carry out a fresh adjustment and increase the distance between min. and max. adjustment

**? E036**

- no operable sensor software

→ carry out a software update or return instrument for repair

**? E042/E043**

- hardware error, electronics defective

→ exchange instrument or return it for repair

### 7.3 Instrument repair

If it is necessary to repair KSR-GT 677 please proceed as follows:

- Clean the instrument and pack it damage-proof
- Attach a description of the fault, the ambient conditions and measured product to the instrument
- If necessary, attach a safety sheet to the instrument
- Send the instrument to the respective address of your agency or to the headquarters in Germany. In Germany to the headquarters.

## 8 Dismounting

### 8.1 Dismounting procedure

**Warning:**

Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

### 8.2 Disposal

KSR-GT 677 consists of materials which can be recycled by specialised recycling companies. We have purposely designed the electronic modules to be easily separable. Mark the instrument as scrap and dispose of it according to national government regulations (e.g. in Germany acc. to electronic scrap ordinance).

Materials: see "*Technical data*"

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

## 9 Supplement

### 9.1 Technical data

#### General data

---

Material 316L corresponds to 1.4404 or 1.4435

##### Materials, wetted parts

– Process fitting - rod and cable version	316L and PCTFE
– Process fitting - coax version	316L and PCTFE, Hastelloy C22 (2.4602) and PTFE (TFM 4105)
– tube (ø 21.3 mm / ø 0.84 in)	316L, Hastelloy C22 (2.4602)
– inner conductor (up to the separation cable/rod)	1.4462
– rod (ø 6 mm / ø 0.25 in)	316L, Hastelloy C22 (2.4602)
– cable (ø 4 mm / ø 0.16 in)	1.4401 (316)
– Seal	Viton, Kalrez 63 75, EPDM, Viton FEP-coated

##### Materials, non-wetted parts

– Housing	plastic PBT (Polyester), Alu-die casting powder-coated, stainless steel 316L
– seal between housing and housing cover	NBR (stainless steel housing), silicone (Alu/plastic housing)
– Inspection window in housing cover (option)	Polycarbonate
– Ground terminal	316L

##### Weights

– Plastic housing	760 g (27 oz)
– Aluminium housing	1170 g (41 oz)
– Aluminium double chamber housing	1470 g (52 oz)
– Stainless steel housing	1530 g (54 oz)
– tube (ø 21.3 mm / ø 0.84 in)	approx. 1000 g/m (approx. 10.8 oz/ft)
– rod (ø 6 mm / ø 0.25 in)	approx. 220 g/m (approx. 2.4 oz/ft)
– cable (ø 4 mm / ø 0.16 in)	approx. 80 g/m (approx. 0.86 oz/ft)
– gravity weight (only with cable version)	approx. 325 g (11.5 oz)

#### Lengths (L)

– tube (ø 21.3 mm / ø 0.84 in)	0.3 ... 6 m (1 ... 20 ft)
– rod (ø 6 mm / ø 0.25 in)	0.5 ... 4 m (1.6 ... 13 ft)
– cable (ø 4 mm / ø 0.16 in)	1 ... 32 m (3.3 ... 105 ft)

#### Lateral load

– tube (ø 21.3 mm / ø 0.84 in)	60 Nm (530 lbf/in)
– rod (ø 6 mm / ø 0.25 in)	4 Nm (35 lbf/in)

max. tensile load (cable ø 4 mm / ø 0.16 in)	5 KN (1124 lbf)
--	-----------------

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#### Output variable

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Output signal	4 ... 20 mA/HART
Resolution	1.6 µA
Fault signal	current output unchanged; 20.5 mA; 22 mA; <3.6 mA (adjustable)
Current limitation	22 mA
Load	see load diagram in Power supply
Integration time (63 % of the input variable)	0 ... 999 s, adjustable
Fulfilled NAMUR recommendation	NE 43

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#### Input variable

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Parameter	level of liquids
Min. dielectric figure (lower medium)	by 10 higher than Er of the upper medium
Min. layer thickness (upper medium)	> 100 mm (> 3.9 in)
Min. dielectric figure (upper medium) - coax version	Er >1.4
Dead band - coax version (ø 21.3 mm / ø 0.84 in)	
– top	0 mm
– bottom	0 mm

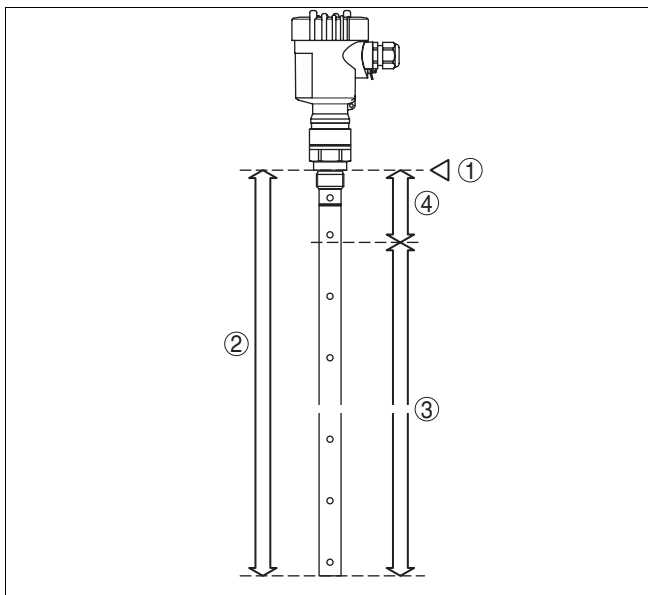


Fig. 20: Measuring ranges of the KSR-GT 677 - coax version

- 1 Reference plane
- 2 Probe length
- 3 Measuring range
- 4 Upper dead band

Min. dielectric figure (upper medium) - Er >1.7  
rod, cable version

Dead band - rod version (ø 6 mm / ø 0.24 in)

- top 150 mm (5.9 in)
- bottom 0 mm

Dead band - cable version (ø 4 mm / ø 0.16 in)

- top 150 mm (5.9 in)
- bottom 250 mm (9.9 in) gravity weight + 100 mm

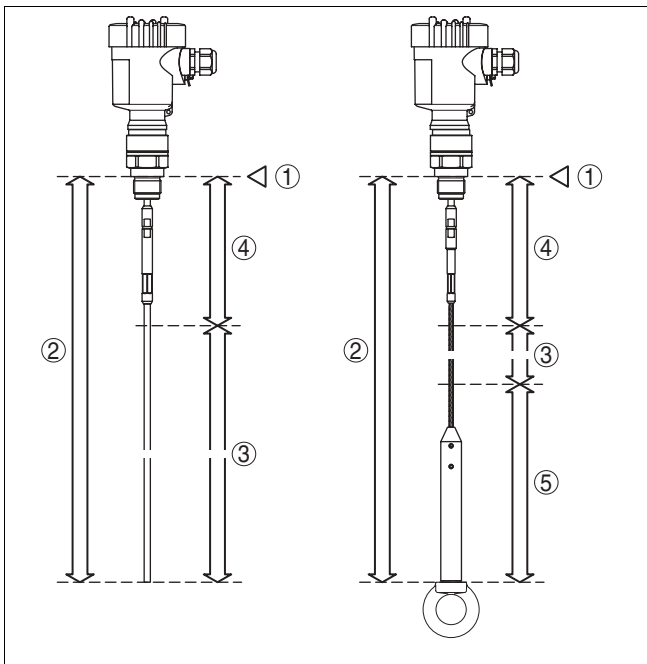


Fig. 21: Measuring ranges of the KSR-GT 677 - rod and cable version

- 1 Reference plane
- 2 Probe length
- 3 Measuring range
- 4 Upper dead band
- 5 lower dead band (only with cable version)

### Accuracy (similar to DIN EN 60770-1)

Reference conditions acc. to DIN EN 61298-1

- Temperature 18 ... +30°C (64 ... +86°F)
- Relative humidity 45 ... 75 %
- Atmospheric pressure 860 ... 1060 mbar (86 ... 106 kPa/  
12.5 ... 15.4 psi)

### Characteristic curve deviation and measurement characteristics

Reference installation conditions

- Flange DN 100
- min. distance to installations 500 mm (20 in)

Reference reflector  
Temperature drift

Metal plate  $\varnothing$  1 m ( $\varnothing$  40 in) not with coax version  
0.06 %/10 K relating to the max. measuring  
range  
see diagrams

Accuracy

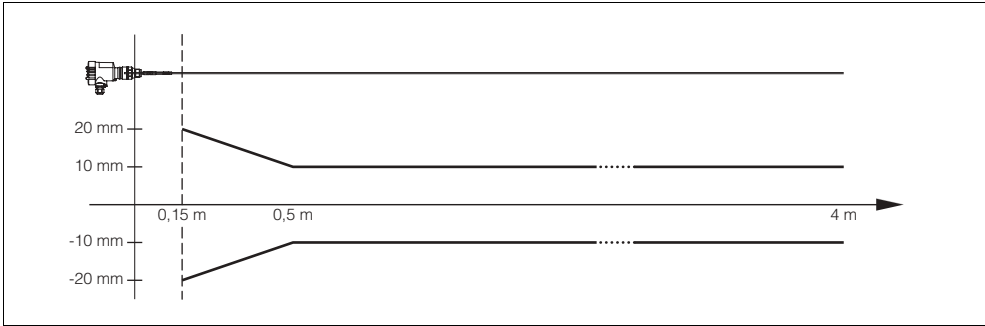


Fig. 22: Accuracy - rod version

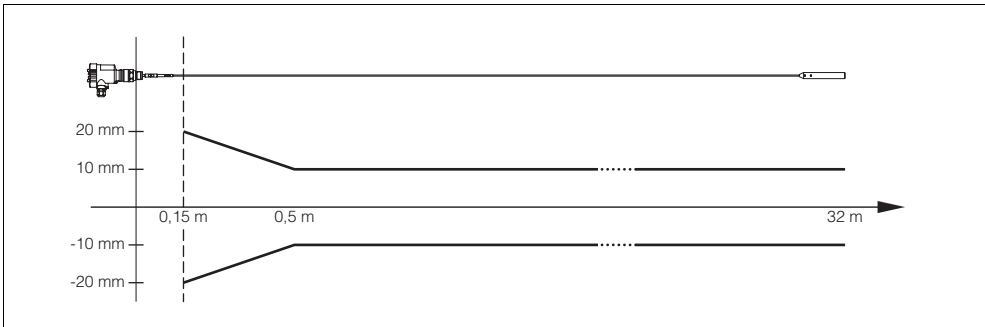


Fig. 23: Accuracy - cable version

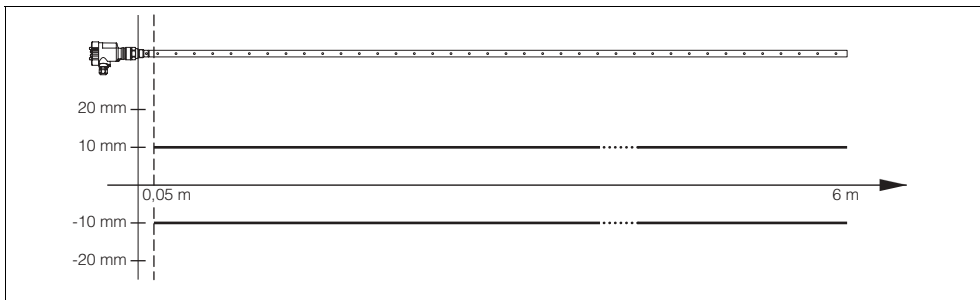


Fig. 24: Accuracy - coax version

## Ambient conditions

Ambient, storage and transport temperature

- without indicating/adjustment module -40 ... +80°C (-40 ... +176°F)
- with indicating/adjustment module -20 ... +70°C (-4 ... +158°F)

## Process conditions

Process pressure -1 ... 40 bar (-100 ... 4000 kPa or  
-14.5 ... 580 psi) dependent on the process fitting

Process temperature (thread or flange temperature)

- Viton -40 ... +150°C (-40° ... +302°F)
- EPDM -40 ... +150°C (-40° ... +302°F)
- Kalrez 6375 -20 ... +150°C (-4° ... +302°F)

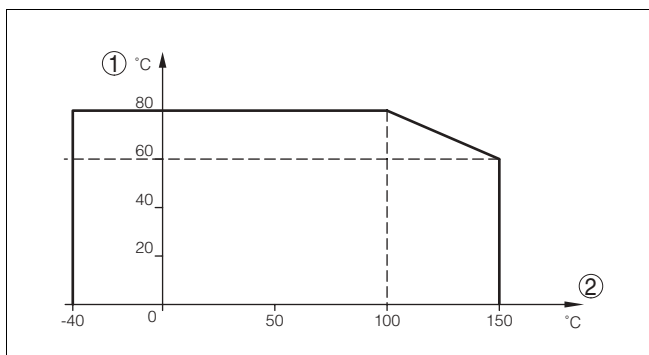


Fig. 25: Ambient temperature – Product temperature

1 Ambient temperature

2 Product temperature (depending on the seal material)

## Electromechanical data – version IP 66/IP 67 and IP 66/IP 68, 0.2 bar

### Cable entry/plug<sup>2)</sup>

#### – Single chamber housing

- 1x cable entry M20x1.5 (cable-ø 5 ... 9 mm), 1x blind stopper M20x1.5

or:

- 1x closing cap ½ NPT, 1x blind stopper ½ NPT

or:

- 1x plug (depending on the version), 1x blind stopper M20x1.5

#### – Double chamber housing

- 1x cable entry M20x1.5 (cable-ø 5 ... 9 mm), 1x blind stopper M20x1.5

or:

- 1x closing cap ½ NPT, 1x blind stopper ½ NPT

or:

- 1x plug (depending on the version), 1x blind stopper M20x1.5

### Spring-loaded terminals

for wire cross sections up to 2.5 mm<sup>2</sup>

<sup>2)</sup> Depending on the version M12x1, acc. to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF

## Indicating and adjustment module

Power supply and data transmission	through sensor via gold-plated sliding contacts (I <sup>2</sup> C bus)
Indication	LC display in dot matrix
Adjustment elements	4 keys
Protection	
– unassembled	IP 20
– mounted into the sensor without cover	IP 40
Materials	
– Housing	ABS
– Inspection window	Polyester foil

## Power supply

Supply voltage	
– non-Ex instrument	14 ... 36 V DC
– EEx ia instrument	14 ... 30 V DC
– EExd ia instrument	20 ... 36 V DC
Permissible residual ripple	
– <100 Hz	$U_{ss} < 1 \text{ V}$
– 100 Hz ... 10 kHz	$U_{ss} < 10 \text{ mV}$
Load	see diagram

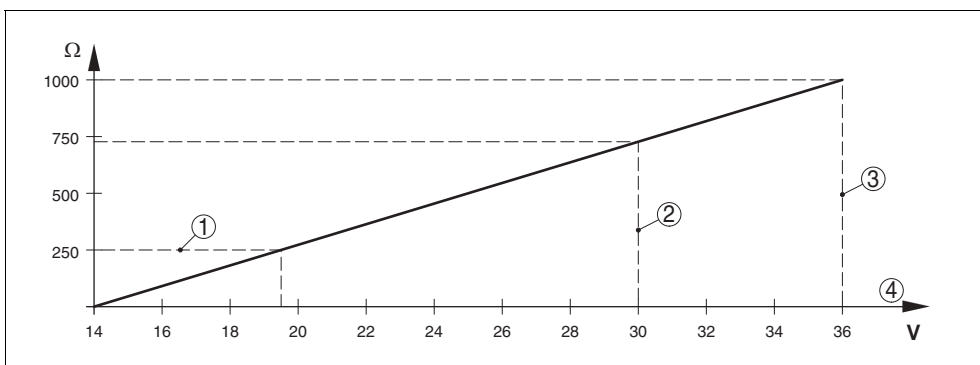


Fig. 26: Voltage diagram

- 1 HART load
- 2 Voltage limit EEx ia instrument
- 3 Voltage limit non-Ex/Exd instrument
- 4 Supply voltage

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**Electrical protective measures**

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Protection	
– Plastic housing	IP 66/IP 67
– Alu and stainless steel standard	IP 66/IP 68 (0.2 bar) <sup>3)</sup>
– Alu and stainless housing, optionally available	IP 66/IP 68 (1 bar)
Overvoltage category	III
Protection class	II

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**Approvals<sup>4)</sup>**

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ATEX II 1G, 1/2G, 2G EEx ia IIC T6

ATEX II 1/2G, 2G EEx d ia IIC T6

Ship approvals

<sup>3)</sup> Requirement to maintain the protection is the suitable cable.  
<sup>4)</sup> Deviating data with Ex applications: see separate safety instructions.

## 9.2 Dimensions

### Housing

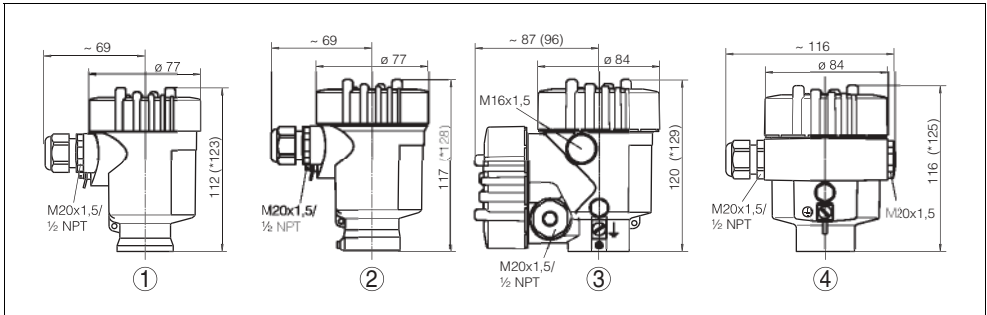


Fig. 27: Housing versions

- 1 Plastic housing (\* dimension with integrated indicating/adjustment module)
- 2 Stainless steel housing (\* dimension with integrated indicating/adjustment module)
- 3 Aluminium double chamber housing (\* dimension with integrated indicating/adjustment module)
- 4 Aluminium housing (\* dimension with integrated indicating/adjustment module)

Technical drawing of the 1500 Series Cable Mounting Bracket, showing side and front views with dimensions and part numbers.

**Part Numbers:**

- 36 (G $\frac{3}{4}$ ,  $\frac{1}{2}$  NPT)
- 41 (G1, 1 NPT)
- 46 (G1 $\frac{1}{2}$ , 1 $\frac{1}{2}$  NPT)

**Dimensions:**

- Overall height: 158mm (6 7/32")
- Bracket height: 22mm (55/64")
- Bracket width: 12mm (15/32")
- Bracket diameter:  $\phi 6mm$  (15/64")
- Bracket hole diameter:  $\phi 4mm$  (5/32")
- Bracket hole spacing:  $\phi 20mm$  (25/32")
- Bracket hole diameter:  $\phi 30mm$  (1 3/16")
- Bracket hole spacing: 53mm (2 3/32")
- Bracket hole diameter:  $\phi 54mm$  (2 1/8")
- Bracket hole diameter:  $\phi 20mm$  (25/32")
- Bracket hole spacing: 150mm (5 29/32")

## KSR-GT 677 - coax version

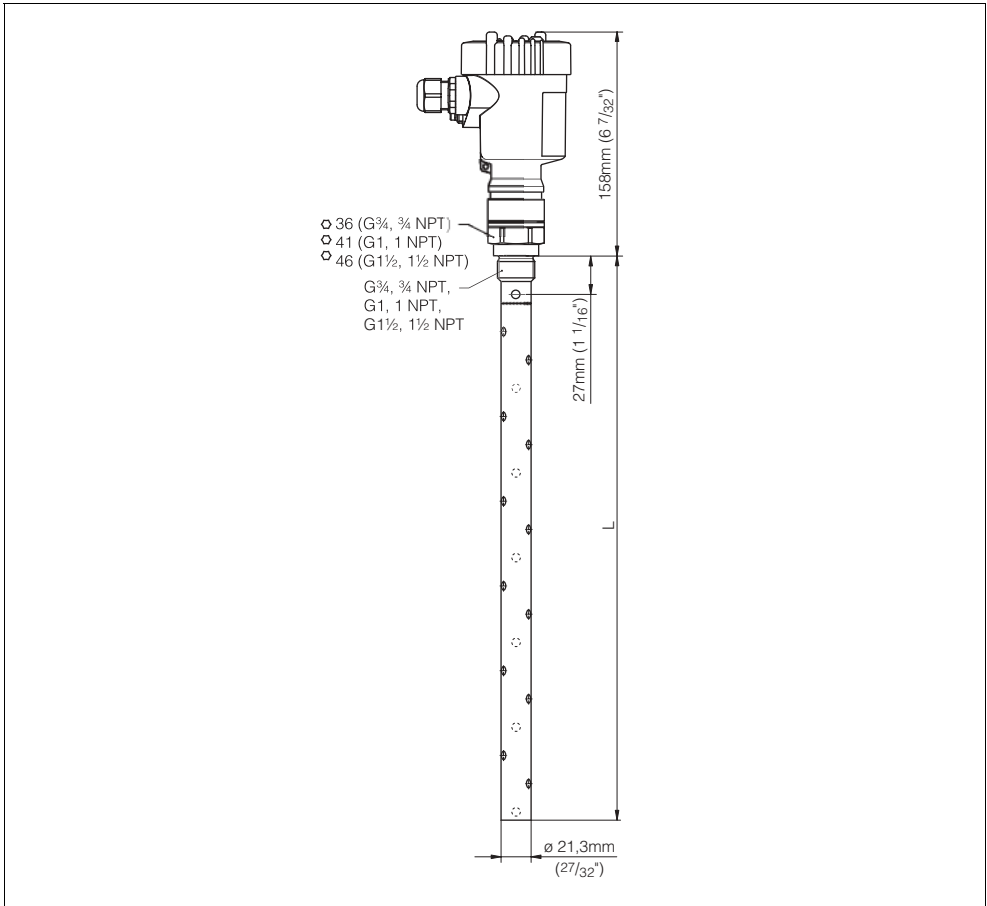


Fig. 29: KSR-GT 677 - coax version with thread  
 L = Sensor length, see Technical data

## 9.3 Certificates

### CE declaration of conformity



# Konformitätserklärung

**Declaration of conformity**  
**Déclaration de conformité**



erklärt in alleiniger Verantwortung, daß das Produkt / declare under  
our sole responsibility that our product / déclare sous sa seule  
responsabilité que le produit

**KSR-GT 611, KSR-GT 622, KSR-GT 655, KSR-GT 666**

auf das sich diese Erklärung bezieht, mit den folgenden Normen  
übereinstimmt / to which this declaration relates is in conformity  
with the following standards / auquel se réfère cette déclaration  
est conforme aux normes

Emission / Emission / Emission ⇒ EN 61326 : 2004 Klasse B  
Immission / Susceptibility / Immission ⇒ EN 61326 : 2004 einschließlich Anhang A  
EN 61010 – 1 : 2001

gemäß den Bestimmungen der Richtlinien / following the provision  
of Directives / conformément aux dispositions des Directives

Schiltach, 08.06.2005

  
 Ralph Thomas Kübler  
 Vorstand / Chairman / Président

Fig. 30: CE declaration of conformity





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